

CLAIMS

WE CLAIM:

1. A seed planting unit comprising:
a planting unit frame that carries:
 - i. a seed trench opening assembly including a seed trench forming member operable to create a seed trench in a ground surface;
 - ii. a seed delivery assembly delivering seeds into the seed trench;
 - iii. a seed trench closing assembly operable to close the seed trench; anda planting unit support assembly including A) a pair of opposing gauge wheels in mechanical communication with the frame, and B) at least one rear press wheel in mechanical communication with the gauge wheels,
wherein a vertical displacement of one of the gauge and press wheels in a first direction produces a biasing force on the other of the gauge and press wheel in a direction opposite the vertical displacement.
2. The seed planting assembly as recited in claim 1, wherein the vertical displacement has a height, and wherein the vertical displacement produces a planting unit vertical displacement less than one-half the height.
3. The seed planting unit as recited in claim 1, wherein vertical movement of one gauge wheel is reciprocated by the opposing gauge wheel,
4. The seed planting unit as recited in claim 3, wherein the gauge wheels are connected at to the frame via gauge wheel arms that operate reciprocally in response to a vertical translation of one of the gauge wheels.
5. The seed planting unit as recited in claim 4, wherein press wheel assembly includes a pair of press wheels that operate reciprocally in response to corresponding vertical gauge wheel translation.
6. The seed planting unit as recited in claim 5, wherein the gauge wheel arms define upper ends that are connected to a bracket that pivots in response to vertical gauge wheel translation.

7. The seed planting unit as recited in claim 6, wherein at least one tandem arm connects the rear press wheel assembly to at least one gauge wheel.
8. The seed planting unit as recited in claim 7, wherein at least one gauge wheel arm is connected to the tandem arm.
9. The seed planting unit as recited in claim 8, wherein the gauge wheel arm is connected to the tandem arm substantially at a midpoint between the press wheel and the gauge wheel.
10. The seed planting unit as recited in claim 7, wherein the rear press wheel assembly comprises a pair of independently suspended press wheels connected to both gauge wheels via a corresponding pair of tandem arms.
11. The seed planting unit as recited in claim 6, wherein the rear press wheel assembly includes a pair of press wheels connected to opposite ends of a press wheel axle.
12. The seed planting unit as recited in claim 11, wherein the axle is rotatable with respect to the planting unit frame.
13. The seed planting unit as recited in claim 12, wherein the axle is connected at a midpoint between the press wheels to the planting unit via a linkage.
14. The seed planting unit as recited in claim 13, further comprising:
 - a linkage defining a forward end and a rearward end, wherein the forward end is in communication with the bracket; and
 - a bell crank defining three connection locations, wherein the first location is connected to the rearward end of the linkage, and wherein the second location is connected to the planting unit frame, and wherein the third location is in communication with the press wheel assembly.
15. The seed planting unit as recited in claim 14, wherein the third location is connected to the linkage.
16. The seed planting unit as recited in claim 15, wherein the linkage provides a downward force against the press wheel assembly.

17. The seed planting assembly as recited in claim 16, wherein the linkage comprises a spring providing shock isolation.

18. The seed planting unit as recited in claim 16, wherein the linkage comprises a pair of linkage segments connected in one of a plurality of positions.

19. A method for reducing seed trench depth variations during operation of a seed planting unit including 1) a planting unit frame that carries i) a seed trench opening assembly including a seed trench forming member operable to create a seed trench in a ground surface, ii) a seed delivery assembly delivering seeds into the seed trench, and iii) a seed trench closing assembly operable to close the seed trench, and 2) a planting unit support assembly including i) first and second opposing gauge wheels in mechanical communication with the frame, and ii) at least one rear press wheel in mechanical communication with the gauge wheels, the steps comprising:

A) causing a vertical displacement of one of the first gauge wheel and the press wheel in a first direction relative to the frame;

C) biasing the other of the first gauge wheel and the press wheel in a direction opposite the first direction relative to the frame in response to step (A).

20. The method as recited in claim 19, wherein the gauge wheels are connected to the frame via gauge wheel arms having upper ends that engage opposite ends of a bracket that is pivotally connected to the frame, wherein step (A) further comprises pivoting the bracket to displace the other gauge wheel in the opposite direction.

21. The method as recited in claim 20, further comprising the step of connecting the press wheel assembly to at least one of the gauge wheels via a tandem arm, wherein one of the gauge wheel arms defines a lower end that is connected to the tandem arm.

22. The method as recited in claim 20, further comprising the step of connecting the press wheel assembly to the bracket via a bell crank that 1) is pivotally connected to the frame at one location, 2) in mechanical communication with the press wheel assembly at a second location, and 3) in mechanical communication with the bracket at a third location.

23. The method as recited in claim 19, wherein the first direction is an upwards direction, and wherein the opposite direction is a downwards direction.

24. A method for reducing seed trench depth variations during operation of a seed planting unit including 1) a planting unit frame that carries i) a seed trench opening assembly including a seed trench forming member operable to create a seed trench in a ground surface, ii) a seed delivery assembly delivering seeds into the seed trench, and iii) a seed trench closing assembly operable to close the seed trench, and 2) a planting unit support assembly including i) first and second opposing gauge wheels in mechanical communication with the frame, and ii) first and second opposing rear press wheels in mechanical communication with the gauge wheels, the steps comprising:

A) causing a vertical displacement of the first press wheel relative to the frame in a first direction; and

B) biasing the second press wheel in a second direction opposite the first direction relative to the frame in response to step (A).

25. The method as recited in claim 24, further comprising the step of:

C) causing a vertical displacement of at least one of the gauge wheels relative to the frame.

26. The method as recited in claim 25, wherein vertical displacement the gauge wheel is reciprocated by the opposing gauge wheel.

27. The method as recited in claim 24, further comprising the step of connecting the rear press wheels via an axle.

28. The method as recited in claim 27, further comprising the step of connecting a midpoint of the axle to the frame.

29. The method as recited in claim 28, wherein each press wheel is independently displaceable with respect to the midpoint.